



Gas Detection

Catalog 2020

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GasScreen 40

Multi-channel control unit

- 4 channels 4-20 mA
- 16 channels RS-485
- Large 5" colour touch screen display
- Maximum versatility
- Easy assembly and configuration
- Powerful CPU for input and alarm management
- Optional WiFi and Datalogging

The control unit for gas monitoring **GasScreen 40** enables the connection of 4 inputs in 4-20mA or 16 inputs in RS-485.

The input terminal block also accepts 0-20 mA signals, or in Volts (0-5 V, 0-10 V), making this control unit versatile also for managing sensors with different input logics.

The connectable sensors can be all those available, for combustible gases, oxygen and toxic gases.

The configuration of the connected sensors, as well as the detection parameters and alarm modification, are carried out on a large and comfortable 5" colour touch screen display, in a simple and intuitive way, which displays the measurement in real time, the relative unit and the type of gas detected, providing clear information in case of alarm: The channel display in alarm will turn yellow in case of fault alarm (sensor malfunction or absence of electrical signal), orange if the first alarm threshold is exceeded and red if the second alarm threshold is exceeded.

During the configuration steps, the user is guided by a simple and functional menu.

For slight deviations around the sensor calibration value, it is possible to act directly on the **GasScreen 40** from the relative auto-calibration menu, thus being able to align the measured value without having to act on the sensor.

A bottom plate for wall mounting ensures easy installation on any type of surface.

The CPU is set up for local wireless or GPRS connection (by inserting an optional card inside the instrument); Internet connection is available on the Ethernet socket.

The datalogger (optional) enables the storing of up to 30 days of measures at one-minute intervals, as well as all alarm events that occurred during the given period, and these data can then be exported to a USB stick to visualise trends in the gas concentration graph, directly on the large display.

Order information

GasScreen 40	Cod. 1004300
Datalogger for GasScreen 40	Cod. 1004310

With the use of toxic gas sensors, GasScreen also provides alarms related to exposure over time: TLV TWA and TLV STEL, differentiated by their corresponding messages and colours on the display.

For each channel there are 2 relay contacts (8 relays in total); then there is a general alarm contact, a fault alarm relay common to the 4 channels and 2 "spare" relays that can be used, for example, in case of TLV alarms.



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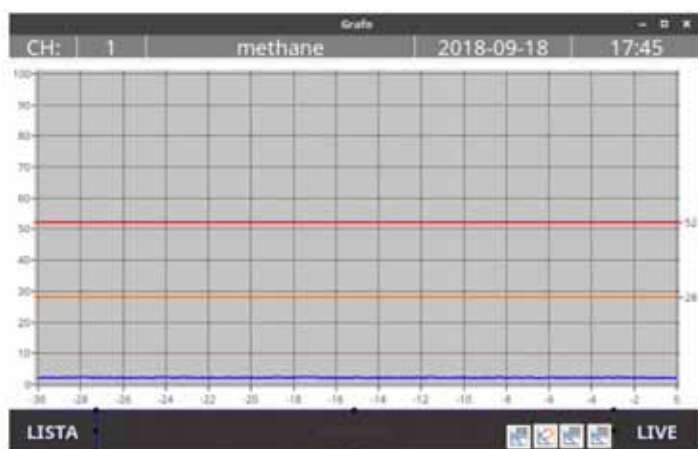
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S. C. € 110.000,00 fully paid capital
C.C.I.A.A. 38999 GE
RE.A. 365226 GE
VAT and fiscal code 03618890101



The colour display indicates the alarm level (yellow stands for fault, orange for first threshold exceeding and red for second threshold exceeding, while green indicates no alarm in progress). 4 channels are displayed simultaneously, each with its own identifying name, gas name and corresponding mA output. If there are more than 4 sensors connected, the channel that goes into alarm is automatically displayed on the main screen.

In the programming menu, you can enable/disable each channel. Then, for each active channel, it is possible to select the gas name from a drop-down menu (from a pre-loaded library that also includes the toxic gas TLV thresholds), then enter an identifying name (for example the name of the room where the sensor is installed), set the alarm thresholds and the latching type (automatic or manual return of the alarm signal).



The datalogging function enables, for each channel, the storing of data related to the last 30 days. By selecting the channel of interest, the tendency of the measured concentration graph is shown in full display, with reference to the relative alarm thresholds. Data can be exported to a pen drive via the USB port on the GasScreen 40.

In the calibration menu, both zero point and span calibration can be carried out directly on the GasScreen 40 unit, thus enabling alignment of the values with those desired when the deviation is within an acceptable tolerance percentage.



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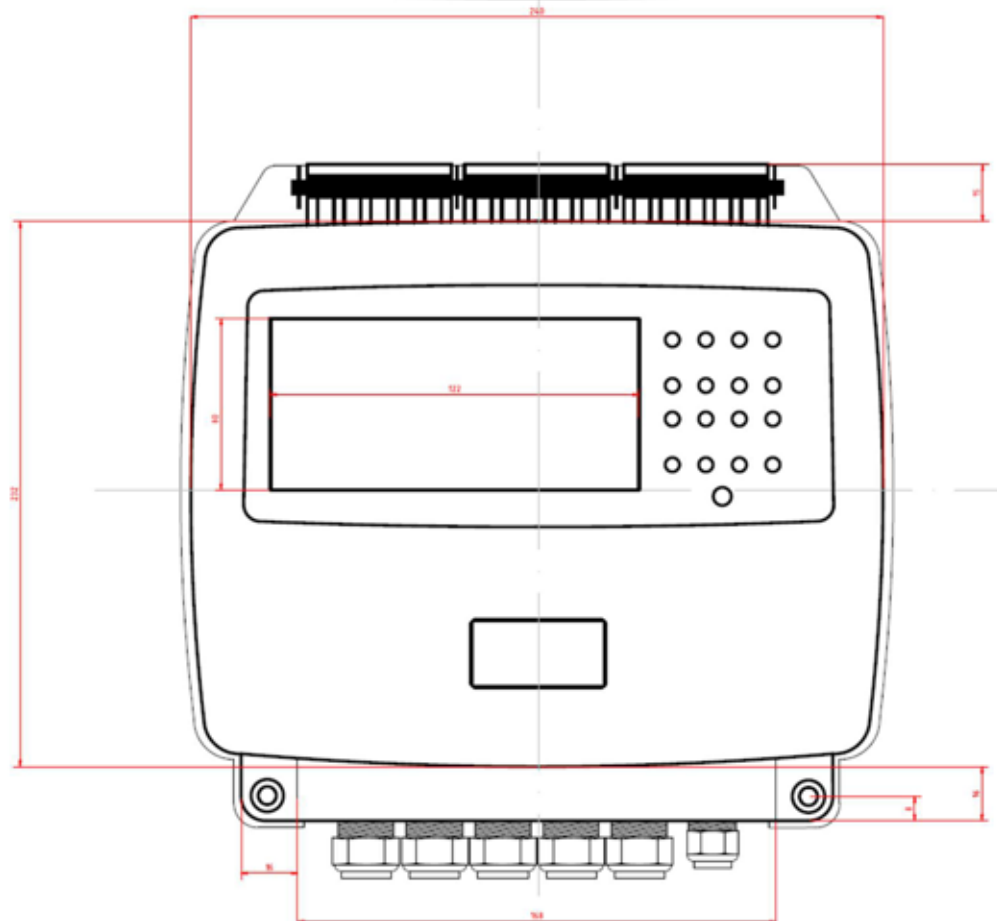
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GasScreen 40

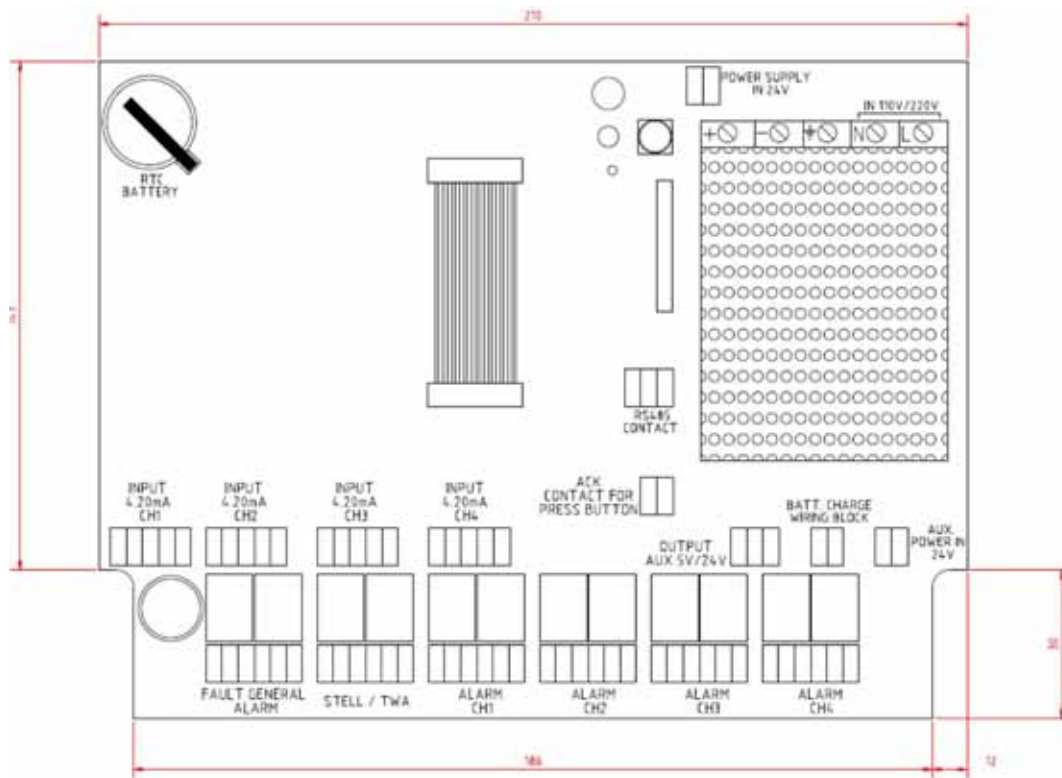


General technical specifications	
Capacity	<ul style="list-style-type: none"> Up to 4 analogue channels Up to 16 channels in RS-485
Types of inputs	Two- or three-pole, mA, mV, max 36 W total (without dedicated A/V unit)
Sizes	250 x 265 x 80 mm.
Container	ABS Polycarbonate, wall-mounted
Weight	1780 gr.
User interface	
Display	5" colour touchscreen LCD. Graphical user interface
Visual indicators	<ul style="list-style-type: none"> N. 2 red LED for gas thresholds (A1 and A2) N. 1 yellow LED for general alarm (fault) N. 1 green LED for active channel signalling
Acoustic alarm	Buzzer activated in case of alarm, 90dB
Button	Common for alarm silencing/acknowledgement
Programmable parameters	<ul style="list-style-type: none"> Offset and range for each channel 2 alarm levels per channel Customizing the measured parameter
Language	Italian, English
Power supply	
AC power supply	220 Vac
DC power supply	24 Vdc
Absorption	Max 240 W
Environmental specifications	
Operating temperature	0°C to + 55°C
Humidity	0% to 95% relative humidity (non-condensing)
Available I/O modules	
Inputs	<ul style="list-style-type: none"> 4 analogue inputs in 4-20 mA, 0-20 mA, 0-5 V, 0-10 V 16 digital inputs in RS-485
Relay outputs	<ul style="list-style-type: none"> N. 1 general alarm relay N. 1 fault signalling relay, common to the 4 channels N. 2 channel relay (A1 and A2) N. 2 spare relay (usable for STEL and TWA)
4-20 mA output	4 repeated and isolated mA outputs, 0-100% FSD = 4-20 mA
Common inputs	Remote reset
Common outputs	12 alarm signals, General fault alarm
Approvals	
Compliance Certificate	EC
Other	
Data registration	Configuration, events and recorded data (optional)
Communication	Ethernet, Wi-Fi, USB
Battery	Backup, optional

GasScreen 40 - Front view



GasScreen 40 - Motherboard



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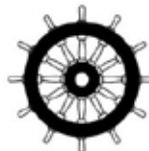
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Explorer 4

Multi-channel rack-mounted control unit

- 4 channels 4-20 mA
- Backlit display
- Easy rack assembly
- Modular up to 4 units for 16 sensors



The control unit **Explorer 4** is a multi-channel analysis system, which enables collecting in a single rack four control units to detect flammable and toxic gases, oxygen or other parameters.

The system **Explorer 4** is designed for continuous gas monitoring and alarm control.

It is housed in a rack for easy panel installation, containing the power supply, display, control and alarm cards. If more than 4 analysis points are required, racks are available for 2 units (8 points), 3 units (12 points) with 19" standard or 4 units (16 points) always with 19" standard but with separate rack for power supply cards.

Explorer 4 has a 16-character alphanumeric display on the front, 3 multifunction buttons for programming and a series of LEDs for visual signalling of voltage presence, exceeding gas threshold and fault (general alarm).

The display shows the gas concentration present and the relative unit of measurement.

Each channel, independent, is equipped with 4 LEDs and 3 output relays one for each alarm threshold.

A general alarm relay and a fault relay are available in common to all 4 channels.

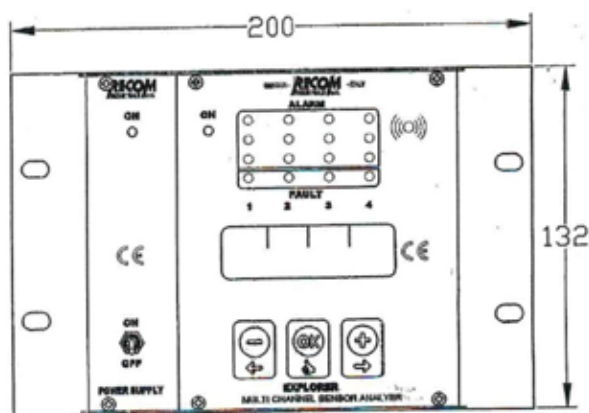
In the system **Explorer 4** all operations are carried out by using 3 programming keys.

The **Explorer 4** is MED approved for naval applications.

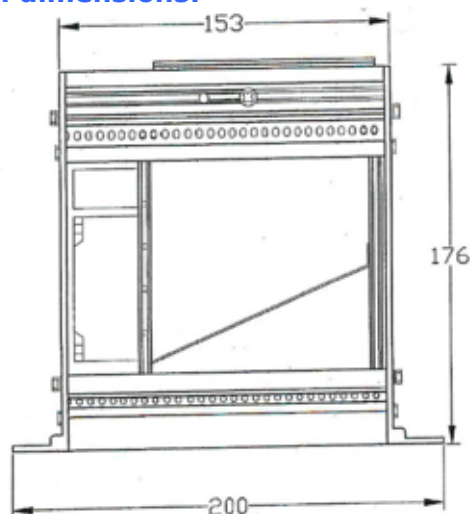
Order information

Explorer 4	Cod. 1004050
Power supply	Cod. 1001075
Rack for one unit	Cod. 1001120

Rack installation - overall dimensions:



Front view



Top view

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Explorer 4



General technical specifications	
Capacity	<ul style="list-style-type: none"> Up to 4 analogue channels per unit Up to 16 channels on 19" rack
Types of inputs	Two- or three-pole, mA, max 36W total (without dedicated A/V unit)
Sizes	Depth 105 mm (21U) x height 132.5 mm (3HE)
Weight	1700 gr.
User interface	
Display	LCD 2x16 digits, backlit
Visual indicators	<ul style="list-style-type: none"> N. 3 red LEDs of gas thresholds (A1 and A2) N. 1 yellow LED stands for fault channel N. 1 green LED for live
Acoustic alarm	Buzzer activated in case of alarm, 90dB
Button	3 buttons for programming
Programmable parameters	<ul style="list-style-type: none"> Offset and range for each channel 3 alarm levels per channel Channel sampling time
Language	Italian, English
Power supply	
AC power supply	110-220 Vac
DC power supply	18-28 Vdc
Absorption	5 - 25 W
Environmental specifications	
Operating temperature	-20°C to + 55°C
Humidity	0% to 95% relative humidity (non-condensing)
Available I/O modules	
Inputs	4 analogue inputs in 4-20 mA
Relay outputs	<ul style="list-style-type: none"> N. 1 general alarm relay N. 1 fault signalling relay, common to the 4 channels N. 3 relays per channel (A1, A2, A3)
Analogue output	4 - 20 mA, 2 or 3 conductors
Approvals	
Electromagnetic compatibility	EMC/RFI (EN 50270:2015) - EC
Maritime	<ul style="list-style-type: none"> RINA ELE 272113CS MED Mod B & E 272113CS
Performance	<ul style="list-style-type: none"> EN 60076-29-1:2007 EN 50104:2010
Other	
Battery	Backup, optional

	<h2>GasScreen 160</h2>	
	<h3>Multi-channel control unit</h3>	
	<ul style="list-style-type: none"> ▪ 16 channels 4-20 mA ▪ 256 x 2 channels RS 485 MODBUS RTU ▪ Large colour touch screen display ▪ Maximum versatility ▪ Easy assembly and configuration ▪ Powerful CPU for input and alarm management 	
		

The control unit for gas monitoring **GasScreen 160** enables 16 input connection in 4-20mA or 494 inputs in RS-485 (2x256), using modular cards that are easy to insert and program.

The connectable sensors are all available, with 2 or 3 conductors, for combustible gas, oxygen and toxic gas. Calibration and configuration of connected sensors as well as of detection parameters, and modification of alarms, are carried out on a large and comfortable colour touch screen display, in a simple and intuitive way, which displays the measurement in real time, the relative unit and the type of gas detected, providing clear information in case of alarm with red LEDs and messages on the display.

During the configuration steps, the user is guided by a simple and functional menu.

A bottom plate for wall mounting ensures easy installation on any type of surface. The CPU is set up for local wireless or GPRS connection by inserting an optional card in the device; the internet connection is available on the Ethernet socket.



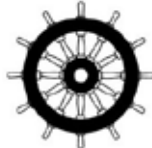


GasScreen 160 is RINA approved for naval applications.

Order information	Gas Screen 160	Cod. 1004400
	Card 2 channels 4-20mA	Cod. 1004780

GasScreen 160



General technical specifications	
Capacity	<ul style="list-style-type: none"> Up to 16 analogue channels Up to 494 channels in RS-485 Up to 16 direct inputs from catalytic sensors
Types of inputs	Two- or three-pole, mA, max 36 W total (with dedicated A/V unit)
Sizes	380 x 320 x 120 mm.
Container	ABS Polycarbonate, wall-mounted
Weight	4,5 Kg. complete with n. 8 cards 2 channels 4-20mA
User interface	
Display	Colour touchscreen LCD, sizes 5.6 x 9.8 cm.
Visual indicators	<ul style="list-style-type: none"> N. 2 red LED for gas thresholds (A1 and A2) N. 1 yellow LED for general alarm (fault) N. 1 green LED for active channel signalling
Acoustic alarm	Buzzer activated in case of alarm, 90dB
Programmable parameters	<ul style="list-style-type: none"> Offset and range for each channel 2 alarm levels per channel Customizing the measured parameter
Language	Italian, English
Power supply	
AC power supply	90-264 Vac
DC power supply	24 Vdc + 5Vdc
Absorption	Max 300 W
Environmental specifications	
Operating temperature	0°C to + 55°C
Humidity	0% to 95% relative humidity (non-condensing)
Available I/O modules	
Inputs	<ul style="list-style-type: none"> 16 analogue inputs in 4-20 mA 256x2 digital inputs in RS-485
Relay outputs	<ul style="list-style-type: none"> No. 1 common general alarm relay N. 2 channel relay (A1 and A2) No. 1 Fault relay
4-20 mA output	4 repeated and isolated mA outputs, 0-100% FSD = 4-20 mA
Approvals	
Electromagnetic compatibility	EMC/RFI (EN 50270:2015) - EC
Maritime	<ul style="list-style-type: none"> RINA ELE 272113CS MED Mod B & E 272113CS
Performance	<ul style="list-style-type: none"> EN 60076-29-1:2007 EN 50104:2010
Other	
Communication	Ethernet
Battery	Backup, optional

	<h2 style="background-color: black; color: white; padding: 5px;">RTC SERIES EXPLORER</h2> <h3 style="background-color: blue; color: white; padding: 5px;">Combustible gases Sensors / Transmitters</h3> <ul style="list-style-type: none"> <i>Ex aluminum case for ¾" NPT cable gland</i> <i>For ATEX 94/9/EC security systems</i> <i>For naval applications RINA - MED</i> <i>Stainless steel sensor</i> <i>Complete set of accessories</i> <i>Excellent value for money</i> <i>High response speed</i> <div style="display: flex; justify-content: space-around; align-items: center;">     </div>
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The RTC series sensors enables continuous monitoring of combustible gases (%LEL) in Exd classified areas. The watertight die-cast aluminium container complies with ATEX specifications.

The internal display, mounted on the Transmitter's PCB card, facilitates the periodic control procedures, verification and calibration, through the simple use of 3 keys.

These sensors are available in the standard version (VQ-01 type) and also in the "poison resistant" version (VQ-21 type) to resist aggressive chemicals such as solvents. The range of RTC sensors is completed with the thermal conductivity sensor (VQ-06 type) for measures up to 100% vol.

The output signal is 4-20mA with 3 conductors.

All RTC sensors are compatible with Explorer control units and any unit that accepts the 4-20mA signal.

The transmitters are equipped with a special circuit that automatically compensates for the zero point drift.

With the keys and the display it is possible to access a library of combustible gases with relative correction factors compared to the standard gas calibration (CH₄).

The catalytic sensors VQ-01 and VQ-06 for flammable gases, and the electrochemical oxygen, CO and H₂S sensors are approved for applications in the naval sector: RINA, MED.

The RTC series consists of the following sensors:

- RTC 1001:** Transmitter sensor of combustible gases 0-100%LEL, VQ-01, standard applications, CH calibration₄
- RTC 1002:** Transmitter sensor of combustible gases 0-100 %LEL, VQ-21 PR, resistant to atmospheres containing silicones, lead, sulphur compounds, and halogenated hydrocarbons
- RTC 1003:** Transmitter sensor 0-100 %VOL Thermal conductivity, VQ-06, for % volume measurement of Methane, Carbon Dioxide, Helium etc.
- RTC 1004:** Transmitter sensor of combustible gases 0-100%LEL, VQ-01, standard applications, calibration different from CH₄ (to be specified when ordering)
- RTC 1005:** Transmitter sensor of combustible gases 0-100%LEL, VQ-21 PR, calibration different from CH₄ (to be specified when ordering)

Order information	RTC 1001	1001700
	RTC 1002	1001710
	RTC 1003	1001730
	RTC 1004	1001705
	RTC 1005	1001715

Technical specifications	
Mechanical	
Container	Die-cast aluminum
Connection	Cable gland ¾ " NPT
Sizes	71 (H) x 40 (D) x 53 (W) mm
Weight	620 gr.
Protection degree	IP-6X
Electrical	
Power supply	12 - 24 Vdc
Absorption	3 W
Connection	4-20mA, 3 conductors
User interface	
Display	Internal 7 segments, 4 digits LCD
Buttons	No. 3 for programming and service operations
Sensor system	
Response time	T ₉₀ < 25 sec.
Sensitivity	0.1%
Linearity	100% on a scale of 0-100%LEL Methane
Maximum exposure	5%Vol. CH ₄
Measuring range	
• Catalytic VQ-01	0 - 100 % LEL
• Catalytic VQ-21 PR	0 - 100 % LEL
• Thermal conductivity VQ-06	0 - 100 % vol.
Operating conditions	
Temperature	-20°C/ + 55°C
Humidity	0% - 95% relative humidity (non-condensing)
Pressure	Atmospheric +/- 10%
Approvals	
Hazardous areas	ATEX II G Ex D IIC T6 Gb
Maritime	<ul style="list-style-type: none"> ▪ RINA ELE 272113CS ▪ MED 272113CS
Programmable parameters	<ul style="list-style-type: none"> ▪ Language (Italian, English) ▪ full scale, substance name, zero alignment and span

Gas	Range	Gas	Range
Methane CH ₄	0 ÷ 100% LEL	Helium He	0 ÷ 100% LEL
Propane C ₃ H ₈	0 ÷ 100% LEL	Chlorobenzene C ₆ H ₅ Cl	0 ÷ 100% LEL
n-Butane C ₄ H ₁₀	0 ÷ 100% LEL	Ethanol C ₂ H ₆ O	0 ÷ 100% LEL
Iso-Butane C ₄ H ₁₀	0 ÷ 100% LEL	Ethane C ₂ H ₆	0 ÷ 100% LEL
n-Pentane C ₅ H ₁₂	0 ÷ 100% LEL	Ethyl acetate C ₄ H ₈ O ₂	0 ÷ 100% LEL
Petrol vapours	0 ÷ 100% LEL	Ethylene C ₂ H ₄	0 ÷ 100% LEL
n-Heptane C ₇ H ₁₆	0 ÷ 100% LEL	Ethyl mercaptan C ₂ H ₆ S	0 ÷ 100% LEL
n-Hexane C ₆ H ₁₄	0 ÷ 100% LEL	Iso-Butanol C ₄ H ₁₀ O	0 ÷ 100% LEL
n-Octane C ₈ H ₁₈	0 ÷ 100% LEL	Isopropyl alcohol C ₃ H ₈ O	0 ÷ 100% LEL
Toluene C ₇ H ₈	0 ÷ 100% LEL	Isobutylene C ₄ H ₈	0 ÷ 100% LEL
Ammonia NH ₃	0 ÷ 100% LEL	Methanol CH ₄ O	0 ÷ 100% LEL
Acetone C ₃ H ₆ O	0 ÷ 100% LEL	Methylmercaptan CH ₃ SH	0 ÷ 100% LEL
Acetylene C ₂ H ₂	0 ÷ 100% LEL	Methyl ethyl ketone C ₄ H ₈ O	0 ÷ 100% LEL
Acetic Acid C ₂ H ₄ O ₂	0 ÷ 100% LEL	Xylene C ₈ H ₁₀	0 ÷ 100% LEL
Benzene C ₆ H ₆	0 ÷ 100% LEL	Methylamine CH ₅ N	0 ÷ 100% LEL
Ethylbenzene C ₈ H ₁₀	0 ÷ 100% LEL		0 ÷ 100% LEL

RTE and RTS SERIES EXPLORER

Toxic Gas Sensors / Transmitters



- Electrochemical cell technology
- Ex aluminum case for 3/4" NPT cable gland
- For ATEX 94/9/EC security systems
- For naval applications RINA - MED
- Stainless steel sensor
- Complete set of accessories
- Excellent value for money
- High response speed



Toxic gas detection is based on the use of an electrochemical cell.

The RTE series sensors enable the continuous monitoring of these gases in Exd classified areas, and are supplied with watertight die-cast aluminium container according to ATEX specifications.

The RTS series sensors, on the other hand, can only be used in safe areas. Some sensors are available only in this version, whereas for the detection of other gases the two solutions are available.

Toxic gas detection is carried out in ppm (parts per million).

The internal display, mounted on the Transmitter's PCB card, facilitates the periodic control procedures, verification and calibration, through the simple use of 3 keys.

The catalytic sensors VQ-01 and VQ-06 for flammable gases, and the electrochemical oxygen sensors, CO and H₂S are approved for applications in the naval sector: RINA, MED.

The transmitters are equipped with a special circuit that automatically compensates for the zero point drift.

RTE Series

Name	Gas	Formula	Range	Code
RTE 1003	Carbon monoxide	CO	0 ÷ 200 ppm	1001780
RTE 1004	Hydrogen sulphide	H ₂ S	0 ÷ 200 ppm	1001800
RTE 1005	Nitrogen dioxide	NO ₂	0 ÷ 50 ppm	1001810
RTE 1006	Nitrogen monoxide	NO	0 ÷ 100 ppm	1001820
RTE 1007	Hydrocyanic acid	HCN	0 ÷ 30 ppm	1001830
RTE 1008	Tetrahydrothiophene	THT	0 ÷ 50 mg/m ³	1001840
RTE 1011	Hydrofluoric Acid	HF	0 ÷ 10 ppm	1001805
RTE 1010	Hydrogen	H ₂	0 ÷ 10.000 ppm	1001790

RTS Series

Name	Gas	Formula	Range	Code
RTS 1001	Ammonia	NH ₃	0 ÷ 100 ppm	1003020
RTS 1002	Sulphur dioxide	SO ₂	0 ÷ 20 ppm	1003030
RTS 1003	Ethylene oxide	ETO	0 ÷ 20 ppm	1001860
RTS 1004	Chlorine dioxide	ClO ₂	0 ÷ 1 ppm	1003040
RTS 1006	Carbon monoxide	CO	0 ÷ 200 ppm	1003060
RTS 1011	Hydrogen Sulphide	H ₂ S	0 ÷ 200 ppm	1003065
RTS 1008	Chlorine	Cl ₂	0 ÷ 50 ppm	1003080
RTS 1009	Phosphine	PH ₃	0 ÷ 5 ppm	1003090
RTS 1010	Hydrochloric Acid	HCl	0 ÷ 50 ppm	1003095

Technical specifications applicable to all electrochemical sensors	
Mechanical	
Container	Die-cast aluminum
Connection	Cable gland ¾ " NPT
Sizes	71 (H) x 40 (D) x 53 (W) mm
Weight	620 gr.
Protection degree	IP-6X
Electrical	
Power supply	12 - 24 Vdc
Absorption	330 mW
Connection	4-20mA, 2 conductors
User interface	
Display	Internal 7 segments, 4 digits LCD
Buttons	No. 3 for programming and service operations
Operating conditions	
Temperature	-20°C/ + 55°C
Humidity	0% - 95% relative humidity (non-condensing)
Pressure	Atmospheric +/- 10%

RTE 1003	CARBON MONOXIDE CO
Nominal measurement range	0 ÷ 200 ppm
Maximum full scale	2,000 ppm (Max. exposure)
Sensor's useful life	24 months in air
Calibration	50 ppm CO / air, cod. 5301216
Signal loss (drift)	< 2% signal / month
Resolution	0.5 ppm
Response time	T ₉₀ < 30 sec.
Approvals	ATEX II G Ex D IIC T6 Gb RINA ELE 272113CS MED 272113CS

RTE 1004	HYDROGEN SULPHIDE H₂S
Nominal measurement range	0 ÷ 200 ppm
Maximum full scale	1,000 ppm (Max. Exposure)
Sensor's useful life	24 months in air
Calibration	25 ppm H ₂ S / air, cod. 5301215
Signal loss (drift)	< 2% signal / year
Resolution	0.30 ppm
Response time	T ₉₀ < 30 sec.
Approvals	ATEX II G Ex D IIC T6 Gb RINA ELE 272113CS MED 272113CS

RTE 1005	NITROGEN DIOXIDE NO₂
Nominal measurement range	0 ÷ 100 ppm
Maximum full scale	100 ppm (Max. Exposure)
Sensor's useful life	2 years occurrence in air
Calibration	10 ppm NO ₂ / air, cod. 5301219
Signal loss (drift)	< 2% signal / month
Resolution	0.1 ppm
Response time	T ₉₀ < 40 sec.
Approvals	ATEX II G Ex D IIC T6 Gb

RTE 1006	NITROGEN MONOXIDE NO
Nominal measurement range	0 ÷ 100 ppm
Maximum full scale	1500 ppm (Max. exposure)
Sensor's useful life	2 years occurrence in air
Calibration	10 ppm NO / air, cod. 5301200
Signal loss (drift)	< 2% signal / month
Resolution	0.5 ppm
Response time	T ₉₀ < 30 sec.
Approvals	ATEX II G Ex D IIC T6 Gb
RTE 1007	HYDROCYANIC ACID HCN
Nominal measurement range	0 ÷ 50 ppm
Maximum full scale	100 ppm
Sensor's useful life	2 years occurrence in air
Calibration	10 ppm HCN / air, cod. 5301218
Signal loss (drift)	< 2% signal / month
Resolution	0.2 ppm
Response time	T ₉₀ < 120 sec.
Approvals	ATEX II G Ex D IIC T6 Gb
RTE 1010	HYDROFLUORIC ACID HF
Nominal measurement range	0 ÷ 10 ppm
Maximum full scale	100 ppm
Sensor's useful life	18 months in air
Signal loss (drift)	< 2% signal / month
Resolution	
Response time	T ₉₀ < 120 sec.
Approvals	ATEX II G Ex D IIC T6 Gb
RTS 1001	AMMONIA NH₃
Nominal measurement range	0 ÷ 100 ppm
Maximum full scale	100 ppm (Max. Exposure)
Sensor's useful life	24 months in air
Calibration	25 ppm NH ₃ / air, cod. 5301210
Signal loss (drift)	< 2% signal / month
Resolution	0.1 ppm
Response time	T ₉₀ < 40 sec.
RTS 1002	SULPHUR DIOXIDE SO₂
Nominal measurement range	0 ÷ 20 ppm
Maximum full scale	150 ppm (Max. exposure)
Sensor's useful life	12 months in air
Calibration	10 ppm SO ₂ / air, cod. 5301217
Signal loss (drift)	< 2% signal / month
Resolution	0.2 ppm
Response time	T ₉₀ < 45 sec.
RTS 1003	ETHYLENE OXIDE ETO
Nominal measurement range	0 ÷ 20 ppm
Maximum full scale	100 ppm
Sensor's useful life	2 years occurrence in air
Signal loss (drift)	< 5% signal / year
Resolution	0.1 ppm
Response time	T ₉₀ < 120 sec.

RTS 1004	CHLORINE DIOXIDE ClO₂
Nominal measurement range	0 ÷ 1 ppm
Maximum full scale	10 ppm (Max. exposure)
Sensor's useful life	2 years occurrence in air
Signal loss (drift)	< 2% signal / month
Resolution	0.1 ppm
Response time	T ₉₀ < 60 sec.
RTS 1005	CHLORINE Cl₂
Nominal measurement range	0 ÷ 20 ppm
Maximum full scale	50 ppm (Max. exposure)
Sensor's useful life	2 years occurrence in air
Calibration	10 ppm Cl ₂ / air, cod. 5301220
Signal loss (drift)	< 2% signal / month
Resolution	0.1 ppm
Response time	T ₉₀ < 45 sec.
RTS 1010	HYDROCHLORIC ACID
Nominal measurement range	0 ÷ 50 ppm
Maximum full scale	100 ppm (Max. Exposure)
Sensor's useful life	2 years occurrence in air
Signal loss (drift)	< 2% signal / month
Resolution	1 ppm
Response time	T ₉₀ < 70 sec.

OTHER SENSORS AVAILABLE UPON REQUEST

EXPLORER O₂ series

Oxygen Transmitters / Sensors



- 3 detection technology
- For ATEX 94/9/EC safety systems in Ex aluminum case for ¾" NPT cable gland
- For naval applications RINA - MED
- For harsh environments and high temperatures
- Complete set of accessories
- Excellent value for money
- High response speed



The oxygen concentration is displayed in % volume.

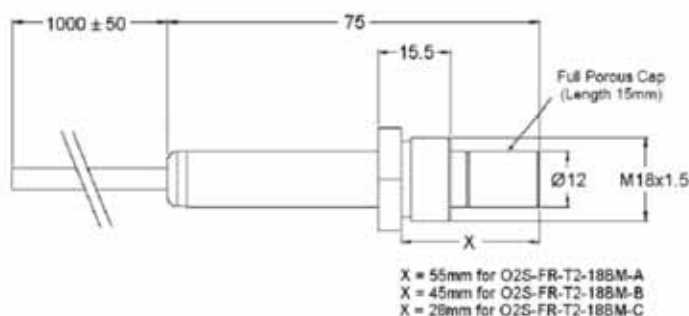
Depending on the application, three different sensors are available: The electrochemical sensor with a range of 0-30% vol, from the RTE series (enables continuous monitoring of oxygen in Exd classified areas, and is supplied with a watertight die-cast aluminium container according to ATEX specifications), the KE-25 type sensor for oxygen measurements up to 100% vol., in atmospheres rich in carbon dioxide (CO₂) and the Zirconium dioxide sensor for oxygen measurements at high temperatures.

The internal display, mounted on the Transmitter's PCB card, facilitates the periodic control procedures, verification and calibration, through the simple use of 3 keys.

Sensors for flammable gas, oxygen, CO and H₂S are approved for applications in the naval sector: RINA, MED and ABS Type approval.

The transmitters are equipped with a special circuit that automatically compensates for the zero point drift.

For the measurement in very hot environments or gas at high temperature, a special Zirconium dioxide (ZrO₂) sensor is used. In this case the 4-20mA transmitter is contained in a plastic container, while the sensor is positioned at the end of a 1 m long cable, and the probe containing the sensitive element is available in 3 different lengths: 28, 45, 55 mm.



Gas	Cell	Formula	Range	Code
Oxygen	Electrochemical	O ₂	0 ÷ 30 % vol.	1001760
Oxygen	KE-25 Type	O ₂	0 ÷ 100 % vol.	1003010
Oxygen	Zirconium dioxide	O ₂	0.1 ÷ 25 % vol. 0.1 ÷ 100 % vol.	1003075

	ELECTROCHEMICAL CELL	KE-25 TYPE CELL	ZIRCONIUM DIOXIDE CELL
Applications	Workplace safety	Measurements in % > of 30% vol.	Measurement of O ₂ in high temperatures environments or gas mixtures

Technical specifications

Mechanical			
Container	Die-cast aluminium	Die-cast aluminium	ABS plastic
Connection	Cable gland ¾ " NPT	Cable gland ¾ " NPT	Cable gland
Sizes	71 (H) x 40 (D) x 53 (W) mm	71 (H) x 40 (D) x 53 (W) mm	150 (W) x 110 (H) x 70 mm
Weight	620 gr.	620 gr.	490 gr.
Electrical			
Power supply	12 - 24 Vdc	12 - 24 Vdc	24 Vcc
Absorption	330 mW	330 mW	3 W
Connection	4-20mA, 2 conductors	4-20mA, 2 conductors	4-20mA, 3 conductors
User interface			
Display	Internal 7 segments, 4-digits LCD	Internal 7 segments, 4-digits LCD	Internal 7 segments, 4-digits LCD
Buttons	No. 3 for programming and service operations	No. 3 for programming and service operations	No. 3 for programming and service operations
Operating conditions			
Temperature	-20 °C ÷ + 55 °C	-20 °C ÷ 55 °C	- 100 °C ÷ +250 °C
Humidity	0% - 95% relative humidity (non-condensing)	0% - 95% relative humidity (non-condensing)	0% - 95% relative humidity (non-condensing)
Pressure	Atmospheric +/- 10%	Atmospheric +/- 10%	260 ÷ 1260 mbar
Measuring cell			
Nominal measurement range	0 ÷ 30 % vol.	0 ÷ 100 % vol.	0.1 ÷ 25 % vol. 0,1 ÷ 100 % vol *
Sensor's useful life	24 months in air	5 years	10 years (clean air)
Calibration	100% N ₂ cod. 5301025	100% N ₂ cod. 5301025	100% N ₂ cod. 5301025
Signal loss	< 5% signal / year	<10%signal / 6 months	-
Resolution	0.1 %	0.1 %	0.1 %
Response time	T ₉₀ < 15 sec.	T ₉₀ < 14 sec.	T ₉₀ < 4 sec.
Approvals			
Hazardous areas	ATEX II G Ex D IIC T6 Gb	-	-
Maritime	RINA ELE 272113CS MED 272113CS	-	-

* with digital Modbus RTU output only 0.1 rage is available ÷ 100 % vol.



SERIES RTI EXPLORER

Sensors / Transmitters with Infrared flow technology

- *Infrared Cell Technology*
- *Active gas flow system*
- *Complete set of accessories*
- *Excellent value for money*
- *High response speed*

The series RTI gas sensors are based on innovative InfraRED technology and are used for gas measurement such as CO₂, CH₄, N₂. They are also used to measure hydrocarbons and methane in nitrogen-rich mixtures.

The technology used is based on a "smart" long distance sensor and on an electronic card equipped with a powerful microprocessor for measurement management, I/O, diagnostics, with relative flow system with integrated pump, which ensures greater precision and better response time.

The sensor is supplied in an aluminium container with a hose connector for air inlet and outlet and a cable gland for the 4-20mA signal output.

Double-channel NDIR

The double-channel technique enables more stable measures over time of the gas concentration, compensating for variations in the IR source emission and minimizing the effects of ageing. The photodetectors are equipped with two optical interference bandpass filters, the first centred on the wavelength in which the gas is absorbed while the second is used as a reference.

Pyroelectric infrared photodetector

Characterized by high performance in terms of responsiveness, low electronic noise and with integrated channel for temperature measurement (measurement compensation from 0-50 °C), the photodetectors used are state of the art for gas concentration monitoring applications.

Solid State IR Source

The sensors integrate MEMs IR emitters consisting of a resistive heating element integrated on a thin dielectric membrane. The spectral emission characteristics are "black body" with high emissivity, low power consumption and high average life with constant emission characteristics.

Gas analysis cell

The optical gas analysis cell has been designed using non-sequential ray tracing SW tools that have allowed to maximize the effective length of the optical path in the smallest possible size in order to achieve the required performance. The gas analysis cells are made of high reflectivity aluminium or AISI 316 steel (and with two optical windows made of calcium fluoride) for the versions used in aggressive industrial environments in order to limit corrosion.

RTI Series

Name	Gas	Available ranges	Accuracy	Zero res (ppm)	Full scale res	Zero repeatability (ppm)	Full scale (ppm)	Code
RTI 1001	Carbon Dioxide CO ₂	0 ÷ 5.000 ppm	±1 FS	1	2% FS	±10	±50	1003000
		0 ÷ 5 % vol.	±2 FS	1	2% FS	±25	±250	
		0 ÷ 10 % vol.	±2 FS	1	2% FS	±25	±250	
		0 ÷ 25 % vol.	±2 FS	1	1% FS	±50	±500	
		0 ÷ 100 % vol.	±2 FS	1	1% FS	±1000	±5000	
RTI 1002	Methane CH ₄	0 ÷ 2.000 ppm	±4 FS	5	4% FS	±15	±100	1003100
		0 ÷ 100 % LEL	±2 FS	15	4% FS	±50	±500	
		0 ÷ 100 % vol.	±2 FS	300	2% FS	±500	±3000	
RTI 1003	Hydrocarbons HC	0 ÷ 100 % LEL	±2 FS	15	4% FS	±50	±500	1003200
RTI 1004	Hydrocarbons HC	0 ÷ 2.000 ppm	±4 FS	5	4% FS	±15	±100	1003300
RTI 1006	Nitrous oxide N ₂ O	0 ÷ 2.000 ppm	±1 FS	1	1% FS	±10	±20	1003410

Technical specifications applicable to all infrared sensors

Mechanical

Container	Die-cast aluminum with hose connector and cable gland
Sizes	Depending on the model, sensor sizes range from 56mm x 48mm x 38mm to 306mm x 48mm x 43mm

Electrical

Power supply	9-24 Vdc, protected
Absorption	Max 90mA @ 9 Vdc
Heating time	<ul style="list-style-type: none"> < 30 sec @ 20°C operational < 30 min @ 20°C full spec
Source frequency	1 ÷ 2 Hz
Refresh	5 ÷ 10 sec.
Response time T ₉₀	15 ÷ 40 sec. @ 20°C and @ 1 l/min.
Analogue output	<ul style="list-style-type: none"> 4-20mA 0-5 V
I/O	<ul style="list-style-type: none"> 4 out: OPEN 4 in: 0-5 V
Connectors	<ul style="list-style-type: none"> Digital I/O: 0015446810 Molex with Pump: SL 3.5/2/180G Weidmüller with Analogue I/O: SL 3.5/2/180G Weidmüller with Power Supply: SL 3.5/2/180G Weidmüller with

Operating conditions

Temperature	0°C / +50°C
Humidity	0% - 95% relative humidity (non-condensing)
Pressure	800 - 1150 hPa. Variation +/- 1.5% on reading per kPa

GAS DETECTION UNIT FOR AMMUNITION DEPOTS FOR MILITARY SHIPS


The gas detection unit shown in the figure is an analysis device that measures the presence of CO, CO₂ and N₂O in the atmosphere, designed for use in the ammunition depots of military ships manufactured by the Italian Navy (100 examples for ships under construction in the period 2017-2022).

The system uses the GasScreen 160 control unit, which is housed, along with the gas detection sensors, within a wall-mounted panel.

The analyser is equipped with a suction pump, which enables the passage of the air to be analysed on the 3 sensors and a data processing system connected to a 7" touchscreen display located in the panel door.

A digital flow meter signals any anomalies in the pneumatic air intake line.

MULTIPOINT EXPLORER


The Multipoint Explorer is a multi-scan system designed for gas detection in hard-to-reach environments. It is used both on board ships and in the Oil & Gas sector.

The system is based on Explorer sensor technology (for the detection of flammable rather than toxic gases), on a GasScreen type control unit and on a system of timed solenoid valves managed by a dedicated PLC.

The building of the system is completely customizable, both in terms of gas to be detected and in terms of the number of suction airways. Common components of the various detections are a suction pump (sized according to the distances to be covered) with relative flow control and a condensate drainage system.

The system can also include an automatic cleaning cycle of the suction line ("purge") and a system for the gas sensor calibration.

In case of naval applications, all the required compliances (RINA, MED, etc.) are provided.

GAS DETECTION PANELS


Recom Industriale manufactures custom systems for gas detection, integrated into wall-mounted panels. The solutions are different and fully customizable.

Within the panels, the sensors of interest and the electronics for the management of measures and alarms are housed.

The suction system enables gas detection at a distance or in hard-to-reach places, even with multiple-scan systems at different points. The air flow is controlled by a digital flow switch that provides an alarm in case of low flow.

If the air to be monitored is at a high temperature (>60°C), the panel is completed with a temperature reduction system. An automatic condensate drainage system can also be provided.

The Recom Industriale's solution is designed to provide a "turnkey" panel, equipped with a terminal block to manage the signals and alarm contacts, two hose connectors for air inlet and outlet and a power socket.

Activities to be monitored: _____

Gas to be analysed: _____ Estimated concentration: _____

Indicate if the panel will be placed in an outdoor/indoor environment: _____

Indicate, if known, the gas conditions:

- Humidity: _____
- Temperature: _____
- Pressure: _____ / Depression: _____

Sampling point:

- Indicate the sampling point type (tube, case, other): _____
- If sampling takes place in a pipe/chimney/conduit, indicate the diameter: _____

Indicate the presence of any other gas (interfering): _____

Indicate the distance from the sampling point to the gas sampling framework: _____

Indicate any size restrictions where the detection panel will be installed: _____

Will the system have to be equipped with Datalogger / data acquisition?	YES	NO
If YES, indicate data acquisition type required (Ethernet, with SIM/SD, with USB, Wireless):	_____	
Is it necessary to forward the sensor signal to a PLC or synoptic?	YES	NO
If YES, indicate the signal type (4-20 mA, RS485, ...):	_____	
Does the system require an external/additional optical/acoustic alarm?	YES	NO
Is there a 220V power supply near the sampling framework?	YES	NO
Is the sampling point in the ATEX zone?	YES	NO
If YES, indicate the distance to reach the safe zone:	_____	
If required, is there compressed air available for cleaning the sampling line?	YES	NO
Does the system need a backup battery?	YES	NO

GAS DETECTION SYSTEMS

Detection solutions for critical security applications



Recom Industriale's gas detection systems are designed to meet the most stringent performance requirements of Customers, Classification Societies and International Bodies for the protection of people and property.

Gas Hazard

On board ships hazardous gas concentrations may occur which, if not properly controlled, may lead to risk of explosion. This is a critical aspect especially for ships carrying highly flammable loads. Safety is a key aspect as immediate support may be required in case of an emergency situation.

Detection and suppression systems, essential for protection against flammable gases, must be added to the ship design and the installation of its components and systems, designed to limit the risk of explosion.

A design solution for every type of ship

The solutions cannot all be the same and there are some decisive factors to take into account when choosing the detection system such as knowledge of the specific application, the appropriate system configuration, reliability and compliance with the requirements of the Classification Body (type approval).

Oil tankers

For this type of ship, the IMO's MARPOL Convention requires the installation of systems to detect the concentration of flammable gases in the load pump room, ballast cases, cofferdam, spaces in double bottoms and empty spaces in the loading area. For the load pump room, not only the detection of hydrocarbons is required, but also the detection of oxygen and hydrogen sulphide (H₂S).

Product carriers

There are different application solutions with the same number of detectors and control units depending on the type of load transported and the specifications of the operator/charterer. The loading area of this type of ship may have, for example, a tube gallery on deck that requires the detection of flammable gases, as well as for ballast cases, where the presence of oxygen must also be monitored.

LNG (Liquified Natural Gas) transport ships

These ships are probably the safest of those built as a result of applying advanced technologies at the design stage.

The IMO Regulation requires that an LNG ship complies with the International Gas Carrier Code (IGC) and the SOLAS Convention.

In addition to portable flammable vapour and oxygen detectors, a gas detection and fire suppression system must be installed, which is activated by the safety control system. The main monitoring points provided in the IGC Code are:

- Cargo compressor rooms;
- Electric engines rooms;
- Cargo control room;
- Closed spaces;
- Airlocks;
- Vent hoods and gas supply lines in the local machines

LNG as fuel

The use of LNG as fuel is now a valid and effective alternative to the use of naphtha and there are many examples of new constructions or conversions of existing ships to this solution. According to data from a major Classification Authority, there are currently about 125 operating ships that use LNG as fuel and that will grow from 400 to 600 in a short period of time.

This means a significant contribution to the reduction of SO_x and NO_x, particulate matter (PM) and black carbon emissions globally and, to a lesser extent, to the reduction of greenhouse gases (GHG).

The IMO has published an "International Code of Safety for ships using gases or other low-flashpoint fuels", known as the IGF Code, to provide common international standards.

Paragraph 15.8 of this Code requires the installation of a fixed gas detection system to monitor several rooms or areas of the ship, including:

- Tank connection spaces;
- Ducts around fuel pipes;
- Machinery spaces containing gas piping, gas equipment or gas consumers;
- Compressor rooms and fuel preparation rooms;
- Enclosed spaces containing fuel piping or other fuel equipment without ducting;
- Other enclosed or semi-enclosed spaces where fuel vapours may accumulate;
- Airlocks;
- Gas heating circuit expansion tanks;
- Motor rooms associated with the fuel systems
- Ventilation inlets to accommodation and machinery spaces if required based on the risk assessment.

The alarm shall be signalled when the gas vapour concentration corresponds to 20% of the Lower Explosive Limit (LEL) and the emergency stop system must be activated when two detectors reach 40% of the LEL.

RECOM Industriale 's gas detection system

Recom Industriale provides a wide range of solutions for both detection and monitoring.

- a) Detectors series GAS POINT, catalytic or infrared type, with analogue or digital output, local reading of values, in watertight or ATEX certified execution
- b) EXPLORER control unit, multi-channel type, modular execution, with serial output for data communication with other systems (fire detection, automation, emergency shut down).
- c) EXPLORER MULTIPOINT control unit, able to connect up to 16 sampling points, automatic calibration, programmable PLC based system
- d) GAS SCREEN 40 control unit, 4 analogue or serial inputs MODBUS RS485, touch screen display, IP65 protection degree, USB device for data storage
- e) GAS SCREEN 160 control unit, 16 analogue inputs or 256x2 digital type (serial), IP65 protection degree, wall mounting

Available Gas Detection System configurations of RECOM Industriale

The type (service) of the ship and the application requirements are the key elements that guide the choice of the configuration of the most suitable gas detection system to be installed on board.

The three basic solutions are:


- Single or multi-point configuration
- Loop configuration with fully redundant data communication. This solution enables detectors to be connected through one or more loops to the HMI system for data and alarm display
- Branch-based configuration, for applications requiring the highest level of availability in case of failure, such as cruise ships or offshore. The system shall remain operational in the event of fire or flooding of a vertical subdivision of the ship as required by the SOLAS Safe Return to Port (SRtP) regulation for passenger ships having a length of more than 120 m or 3 or further Vertical Zones.

BOTTLE OF STANDARD GAS for sensor calibration EN 12205 Standards Compliance

Code	Description
5301010	Aluminum cylinder 1 l 35 bar 13.8% CO₂, 8% Butane/N₂
5301015	Aluminum cylinder 1l 35bar 5000 ppm CO₂/N₂
5301025	Aluminum cylinder 1,5 l 40 bar 100% Nitrogen
5301012	Steel cylinder 1,5 l 68 bar 2,5 % CH₄/air
5301510	Aluminum cylinder 1 l 35bar 50% vol. CH₄/N₂
5301520	Steel cylinder 1,5 l 68 bar 50% LEL Pentane/air
5301215	Aluminum cylinder 1,5 l 40 bar 25 ppm H₂S/air
5301216	Aluminum cylinder 1,5 l 40 bar 50 ppm CO /air
5301217	Aluminum cylinder 1,5 l 40 bar 10 ppm SO₂/air
5301218	Aluminum cylinder 1,5 l 40 bar 10 ppm HCN /N₂
5301219	Aluminum cylinder 1,5 l 40 bar 10 ppm NO₂/air
5301200	Aluminum cylinder 1,5 l 40 bar 10 ppm NO /N₂
5301210	Aluminum cylinder 1,5 l 40 bar 25 ppm NH₃/air
5301220	Aluminum cylinder 1,5 l 40 bar 10 ppm Cl₂/N₂
5301230	Aluminum cylinder 1,5 l 40 bar 5 ppm PH₃/N₂
5301260	Aluminum cylinder 1,5 l 40 bar 5 ppm C₆H₆/air

Technical specifications		
	ALUMINUM	STEEL
Cylinder type	<ul style="list-style-type: none"> - Contents: 58 litres - Service pressure: 34,5 bar - Dimensions: 362 x 89 mm 	<ul style="list-style-type: none"> - Contents: 103 litres - Service pressure: 69 bar - Dimensions: 352 x 83 mm
Required accessories	- Pressure reducer, tube, calibration adapter	
Mixture tolerance	<ul style="list-style-type: none"> - 51-300 ppm: +/- 2%. - 21-50 ppm: +/- 5% - 2-20 ppm: +/- 10% 	
Guarantee of stability	- LEL and mixtures of non-reactive gases	36 months
	- Mixtures with H ₂ S and 4 gas mixes	24 months
	- Mixtures with SO ₂	24 months
	- Mixtures of NO, NH ₃ HCN and PH ₃	18 months
	- Mixtures CL ₂	9 months
	- Mixtures with HCl	12 months
	- Mixtures with NO ₂	6 months

PRESSURE REDUCER - model 715

5301240	Pressure reducer with sleeve connection and pressure gauge, delivery at 0.5 l/min	
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Technical specifications	
Max pressure in	1,000 psig / 35 bar
Max pressure out	60 psig / 4.1 bar
Inlet	5/8 x 18
Outlet	3/16" Barb / 4.8 mm
Gauge	0-1,000 psig / 70 bar
Mechanical characteristics	<ul style="list-style-type: none"> - Brass body - O-rings in Viton - Nickel plated brass cover
Weight	240 gr.

RECOM INDUSTRIALE s.r.l.

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S. C. € 110.000,00 fully paid capital
 C.C.I.A.A. 38999 GE
 RE.A. 365226 GE
 VAT and fiscal code 03618890101

Accessories for sensors

	Description	Code
	Flow cell for Explorer sensor, suitable for applications in systems with active suction. Made of Teflon, supplied with quick-release hose holder	1003540
	Calibration adapter for Explorer sensor, made of transparent resin. Supplied with connection tube to the cylinder	1003570
	Splash guard for Explorer sensor, suitable to protect the sensor from possible water splashes	1003550

Sensors detection and positioning area

Electrochemical Sensor (Toxic Gas)		
Gas	Area	Position
Ammonia – NH ₃	775 m ²	High: between 15 cm and 45 cm from the ceiling
Carbon Monoxide - CO	775 m ²	Average: between 90 cm and 182 cm from the floor
Chlorine - CL ₂	525 m ²	Low: between 15 cm and 45 cm from the floor
Chlorine Dioxide – CLO ₂	525 m ²	Low: between 15 cm and 45 cm from the floor
Hydrogen – H ₂	775 m ²	High: between 15 cm and 45 cm from the ceiling
Hydrochloric Acid - HCL	525 m ²	Average: between 90 cm and 182 cm from the floor
Hydrocyanic acid - HCN	525 m ²	Average: between 90 cm and 182 cm from the floor
Hydrogen sulphide – H ₂ S	525 m ²	Low: between 15 cm and 45 cm from the floor
Nitrogen Monoxide - NO	775 m ²	Average: between 90 cm and 182 cm from the floor
Nitrogen Dioxide – NO ₂	775 m ²	Low: between 15 cm and 45 cm from the floor
Ozone – O ₃	525 m ²	High: between 15 cm and 45 cm from the ceiling
Sulphur Dioxide – SO ₂	525 m ²	Low: between 15 cm and 45 cm from the floor

Catalytic Sensor (Combustible Gas)		
Gas	Area	Position
Acetylene	525 m ²	Average: between 90 cm and 182 cm from the floor
Benzene	525 m ²	High: between 15 cm and 45 cm from the ceiling
Ethane	525 m ²	Average: between 90 cm and 182 cm from the floor
Diesel	525 m ²	Low: between 15 cm and 45 cm from the floor
Hydrogen –H ₂	775 m ²	High: between 15 cm and 45 cm from the ceiling
Methane - CH ₄	775 m ²	High: between 15 cm and 45 cm from the ceiling
Propane - C ₃ H ₈	775 m ²	Low: between 15 cm and 45 cm from the floor
N-Butane	525 m ²	Low: between 15 cm and 45 cm from the floor
N-Octane	525 m ²	Low: between 15 cm and 45 cm from the floor
N-Pentane	525 m ²	Low: between 15 cm and 45 cm from the floor
Toluene	525 m ²	High: between 15 cm and 45 cm from the ceiling
Helium	775 m ²	High: between 15 cm and 45 cm from the ceiling

NDIR sensor		
Gas	Area	Position
Carbon Dioxide	775 m ²	Low: between 15 cm and 45 cm from the floor

The area indicated is subject to change for various reasons:

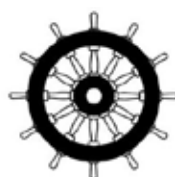
- The presence of walls, cavities, openings in the wall or floor, etc. influences the quantity and positioning of sensors
- The presence of air intakes, air exhausts, turbulence or dead zones without air Influences the quantity and positioning of sensors.
- The possibility of gas leaks or leaks from potential points influences the quantity and positioning of sensors.
- The area indicated must be occupied and subject to air renewals.

Approvals

Recom Industriale's detection systems are suitable for use as part of security systems in accordance with **ATEX 94/9/EC directive** according to EN 60079-0, EN 61241-0, EN 61241-1:



For **naval applications** the control units and sensors are manufactured in accordance with the international MED naval standard:



The company operates under the standard of quality dictated by the ISO 9001 and ISO 14001. Recom Industriale is equipped with a **testing and calibration laboratory certificate by R.I.N.A.** as a Testing Laboratory (certificate no. 2018GE01 1984), in compliance with the provisions of the standards
IEC 17025, CEI EN 50104, 60079/29/1



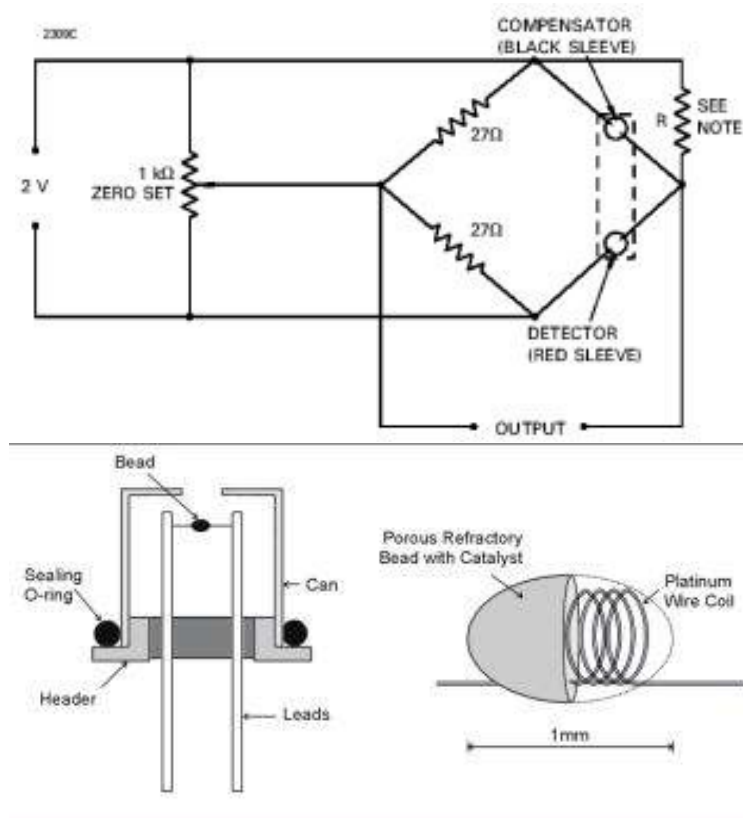
APPENDIX A

Operating principle of the LEL catalytic sensor

Recom Industriale's Combustible Gas Sensors operate on the catalytic combustion principle, where the sensitive part consists of a pair of filaments connected to two precision resistors to form a Wheatstone bridge.

One of the two filaments (the detector) is covered by a catalyst, while the other compensator acts as a reference to ensure the stability of the measurement circuit.

When the gas hits the filament, it is oxidized and the heat generated changes the electrical resistance causing an imbalance of the bridge, thus generating an output current signal proportional to the concentration of the flammable gas.



A second sensitive element, usually placed in series with the first in a separate, unheated container with no catalyst, is inserted into a Wheatstone bridge to compensate the measurement as a function of changes in room temperature.

Other environmental parameters such as humidity and pressure affect both pelistors, and therefore the imbalances on the bridge are limited but not negligible.

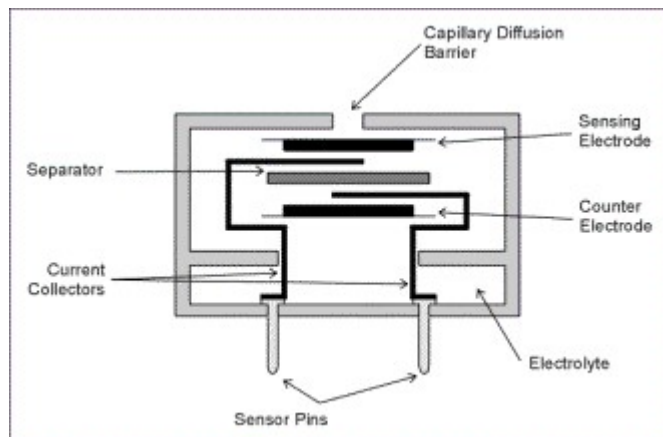
Explorer sensors compensate for environmental changes while maintaining stability in zero maintenance and gas measure.

For the correct catalytic sensor operation, it is necessary that the oxygen is present in the mixture in a concentration of not less than 5% - 10% volume, otherwise the oxidation reaction that determines the detection mechanism is not guaranteed.

APPENDIX B

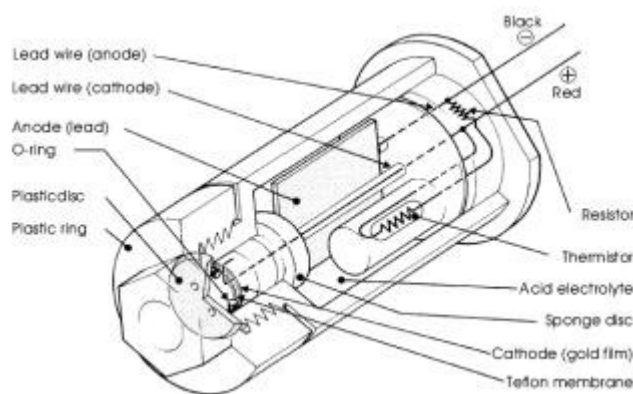
Operating principle of the electrochemical sensor

The operation of an electrochemical sensor is determined by the variation of the electrical parameters of two electrodes immersed in an electrolyte solution.



This variation is caused by the oxyhydrogen-reduction reactions of the gas in contact with the surface of the electrodes. The electrodes and electrolyte are placed in semi-waterproof membranes. To achieve high accuracy and resolution, electrochemical sensors are usually equipped with three electrodes (Reference, Sensing, Counter).

This type of sensor is suitable for detecting toxic gases. Concentrations of hydrogen and carbon oxide can be measured in concentrations below the LEL and of the oxygen up to 100% of the volume.



Electrochemical sensors have a very low energy consumption but react with the gas to be detected and the resulting transformation/consumption of electrode material results in a variation in sensitivity that requires frequent calibration.

The response time may be long for low concentrations, given the slowness of the chemical reaction.

Temperatures below -15°C in some sensors inhibit the action of the electrolyte.

Low temperature and humidity may reduce the sensitivity of the sensor.

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Notes

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